SEA TURTLES NESTING IN THE SIR EDWARD PELLEW ISLANDS, GULF OF CARPENTARIA, NORTHERN TERRITORY

MARK HAMANN, CHLOE SCHÄUBLE, TOM SIMON, JOHNNY JOHNSON, SAMMY EVANS, TONY DORR AND ROD KENNETT

Hamann, M., Schäuble, C.S., Simon, T., Johnson, J., Evans, S., Dorr, T. & Kennett, R. 2006 11 10: Sea turtles nesting in the Sir Edward Pellew Islands, Gulf of Carpentaria, Northern Territory. *Memoirs of the Queensland Museum* **52**(1): 71–78. ISSN 0079-8835.

The northern coastline of Australia supports globally significant populations for at least four species of sea turtles. While Queensland and to a lesser degree Western Australian populations have received considerable attention over the last three decades, there have been few detailed studies of sea turtle rookeries in the Northern Territory. Much of the NT coastline is under the ownership of Aboriginal people, and thus their involvement in any management or conservation of sea turtles is essential. In this study we combined local Aboriginal knowledge with orthodox quantitative sea turtle survey methods to collect baseline information on sea turtle populations in the Sir Edward Pellew Islands (Gulf of Carpentaria). Although four species of sea turtles use these islands for nesting, Flatback (*Natator depressus*) and Green Turtles (*Chelonia mydas*) are the most abundant. Nesting appears to be scattered throughout the islands with the largest concentrations of *C. mydas* and *N. depressus* utilising the beach on north-eastern Vanderlin and northern West Island respectively. Hatchling production was high for both species, however the presence of wild dogs and feral cats on West Island may become a management issue for this rookery in future years. ❐ *Sea turtles, Green Turtle, Flatback Turtle, Northern Territory, Sir Edward Pellew Islands, Aboriginal knowledge, management, nesting.*

Hamann, M. (Corresponding author) & Schäuble, C. Key Centre for Tropical Wildlife Management, Charles Darwin University, Darwin, NT 0909 & School of Tropical Environment Studies & Geography, James Cook University, Townsville, Qld 4811 (email: mark.hamann@jcu.edu.au); Simon, T., Johnson, J. & Evans, S. Mabunji Aboriginal Resource Centre, Borroloola, NT 0854; Dorr, T. Key Centre for Tropical Wildlife Management, Charles Darwin University, Darwin, NT 0909; Kennett, R. Key Centre for Tropical Wildlife Management, Northern Territory University, Darwin, NT 0909, Australia & NAILSMA, Tropical Savannas CRC, Faculty of E, H & S, Building 42, Darwin NT 0909; 11 July 2006.

A large area of the Northern Territory (NT) coastline is owned by Aboriginal people. Sea turtle nesting habitat occurs along much of this coastline, and the NT provides habitat for nationally and internationally significant nesting populations of Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*) and Flatback Turtles (*Natator depressus*) (Guinea, 1994a; Chatto, 1997; Environment Australia, 1998). While data are available on the broad geographical distribution of each of these species, detailed nesting beach surveys have been conducted at only a few sites (Guinea, 1994b; Vanderlay, 1997; Schäuble, 2002). In particular, there are few data on nesting rookeries/populations in the Gulf of Carpentaria (GoC).

The Sir Edward Pellew Islands (SEP) are located in the south-western side of the Gulf of Carpentaria at the mouth of the McArthur and Wearyan Rivers (Fig. 1). The SEP group consists of eight main islands and numerous smaller rocky outcrops, and has a combined land area of around 2,100 square kilometres. The SEP group is the traditional land of both the Mara and Yanyula Aboriginal people, many of whom still reside in permanent Aboriginal outstations that exist on four of the islands, i.e. Mammathumburru (West Island), Wathungka (South-west Island), Jimmimila (Black Craggy) and Yuguie (Vanderlin Island) (Bradley, 1997a).

For the Aboriginal people that live on and around the SEP group, sea turtles hold significant cultural and economic value, and both hunting of turtles in foraging areas and egg collection are widely practiced (Bradley, 1997a, b; Baker, 1999). Not surprisingly, Aboriginal people in the SEP area possess detailed knowledge regarding some aspects of sea turtle biology. For example, such information often includes the nesting distribution, species composition and nesting seasonality of turtles breeding in local regions. However, despite extensive aerial surveys over the SEP region, several records in other herpetological

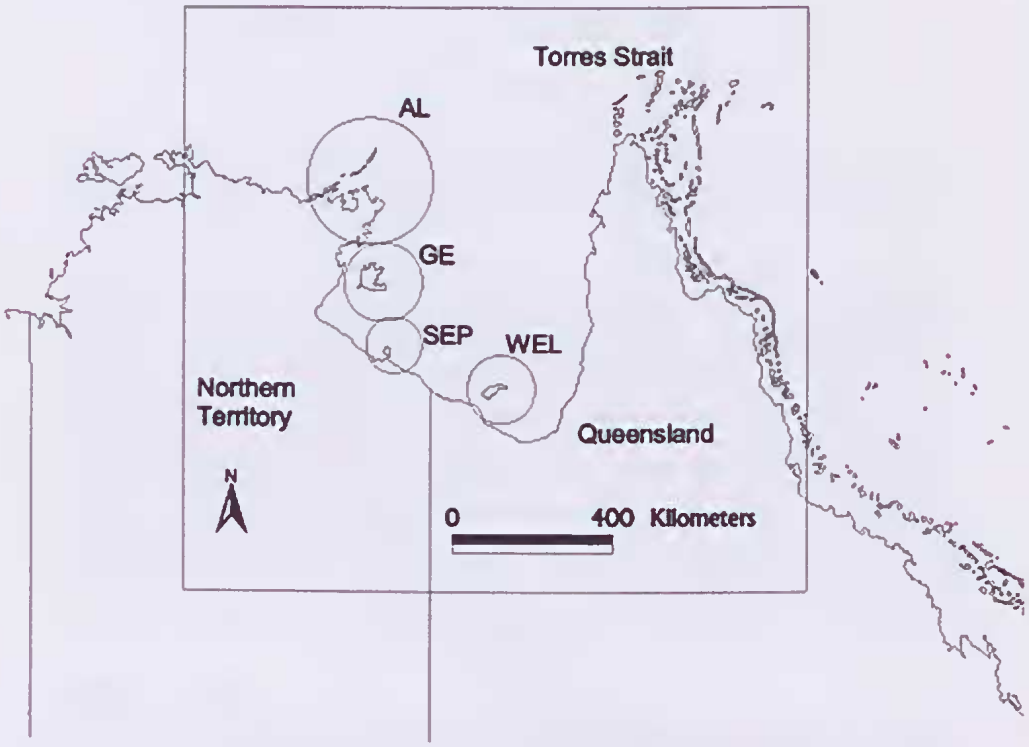

FIG 1. Map of the Gulf of Carpentaria, indicating the location of the Sir Edward Pellew Islands (SEP) in relation to other sea turtle rookeries in this region, AL = north east Arnhem Land, GE = Groote Eylandt, WEL = Wellesley Island group.

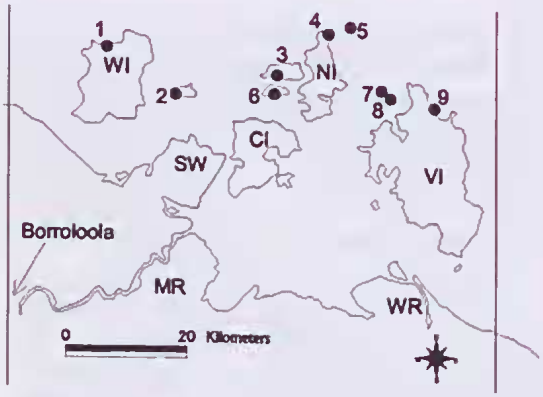

FIG 2. Map of the Sir Edward Pellew Islands showing the locations of turtle nesting sites. WI = West Island, SW = South West Island, CI = Centre Island, NI = North Island, VI = Vanderlin Island, MR = MeArthur River and WR = Wearyan River. •1 = Northern Beach at West Island, •2 = Black Craggy, •3 = Watson Islet, •4 = North Island, •5 = Uquhart Island, •6 = Skull Island, •7 = Turtle Islet, •8 = Small sand bar, •9 = Investigator Bay.

literature (Chatto, 1997; Cogger & Lindner, 1969 and see Limpus & Reed, 1985 for a summary of sea turtle records in the SEP region) and a continuous occupation by Aboriginal people, quantitative data on these and other issues are lacking, e.g. the size of the annual nesting population(s), and hatchling production. Therefore, in the present study we combine the local ecological knowledge provided by three of us (T.S., J.J. & S.E., who are local Traditional Owners/Custodians) with standard turtle survey techniques used by non-Indigenous researchers. We use these sources of information to provide a baseline assessment on sea turtle nesting in the SEP Islands.

METHODS

SURVEY. An aerial survey was flown over the island group on 7 June 2001. Based on data obtained from this flight and discussions with local traditional owners, two beaches were chosen for ground surveys. Information provided to us by traditional owners is identified in the text, either by stating the name of the person or by the

acronym TOI (Traditional Owner Information). We undertook beach surveys of differing durations (from one to seven days), primarily focused on the northern coast of West Island (Fig. 2). Additionally, Investigator Bay on Vanderlin Island and several of the smaller islands (Black Craggy, Turtle Islet and Watson Islet; Fig. 2) were visited occasionally throughout the study period to determine an estimate of turtle nesting density. All survey dates and survey period durations are shown in Table 1.

NESTING TURTLES. Beaches were patrolled on foot each night during survey periods. On arrival at a nesting beach, all tracks from the previous night(s) were recorded and crossed with a foot drag-mark to prevent re-counting on subsequent nights. On the nightly patrols each crawl by a nesting female was recorded and scored according to whether she had laid eggs or not following the methods of Limpus (1985) i.e. a successful nesting attempt was one in which the female oviposited a clutch of eggs, an unsuccessful nesting attempt was one where a female failed to oviposit, and nest sites for which her success at laying eggs could not be determined, were classed as undetermined. For tracks where the turtle was not seen, nesting success was ascertained using characteristics of the track and body pit (Schroeder & Murphy, 1999). Track counts following these methods were conducted on Vanderlin by Archie Johnson on 13 August and 7 September 2001. All turtles encountered were measured (curved carapace length) and tagged with titanium flipper tags (return address QPWS, Brisbane QLD 4002) in the right and left flippers, position three (Limpus, 1985; 1992). Although it was not possible to distinguish between the two species, confirmation to whether either/both Hawksbill (*Eretmochelys imbricata*) and Olive Ridley (*Lepidochelys olivacea*) Turtles nested in the SEP islands was based on descriptions of the size of eggs; numbers of eggs per clutch; track widths and body pit sizes given to us by residents of West Island (R. Dickson, T. Simon & TOI).

CLUTCH SUCCESS. During each patrol of the nesting beach, nests from which hatchlings had emerged were located by following hatchling tracks back up the beach to the nest site. Nests were excavated by digging down to the shell remnants and then sorting the remaining contents into the following categories, empty shell, undeveloped eggs, unhatched eggs, predated eggs, live and dead hatchlings. Unhatched eggs were those with visible signs of embryonic development and undeveloped eggs were those with no visible signs of embryonic development (Limpus, 1985; Miller, 1999). Emergence success of the nest refers to the percentage of eggs that produce hatchlings that made their way to the beach surface. We acknowledge that this method of finding nests is biased as it does not include those nests that fail to produce any hatchlings. Therefore, our data may only be used as an indication of the emergence success of nests that produce some hatchlings to the surface.

RESULTS

NESTING TURTLES. According to local island residents, signs of sea turtle nesting (tracks on the beach) are present all year round. However, the main sea turtle nesting season in this area begins around late May and continues until October (TOI). We only encountered nesting by either *Natator depressus* or *Chelonia mydas*. The average curved carapace length (± standard deviation) was 88.7 ± 2.7cm (range 81.5 to 94.8cm; n = 42) for *N. depressus* and 100.0 ± 1.9cm (range 97.3 to 102.5cm; n = 6) for *C. mydas*. Curved carapace width for *N. depressus* females was recorded in 2002 only, and averaged (± standard deviation) 73.6 ± 2.5 (range 68.0 to 78.0cm; n = 22). We did not re-capture any turtles tagged by us, or by others, although one female (in September 2002) had healed tag scars and it is possible that she was initially tagged while nesting in a previous season (2000 or 2001). Although we did not encounter nesting by *E. imbricata* or *L. olivacea* during any of our field surveys, the traditional owners of West Island indicated to us that turtles smaller than flatback turtles (either *E. imbricata* or *L. olivacea*) arrive early in the nesting season and nest along the far western end of the main nesting beach on West Island (Fig. 2). The number of clutches laid per year by either/both of these species is difficult to estimate, though it is likely to be small: perhaps in the vicinity of <10 per year (Richard Dickson, pers. comm.).

EMERGENCE SUCCESS OF NESTS. During our nightly beach patrols on West Island we found 22 *Natator depressus* emerged nests (containing a mean of 51 ± 7 eggs) and two *Chelonia mydas* clutches (containing 82 and 118 eggs). Note that these clutch counts are based on nest excavations, and not on eggs counted at time of laying, and they may be biased (probably downwards) by error associated with the counting of shells (Cruz & Frazier, 2000). The emergence successes of the *C. mydas* clutches were 95.1% and 98.7%.

The mean emergence sueeess of *N. depressus* clutehes was 91% (± 5%; range 78% to 100%), and the mean percentage of unhatched and undeveloped eggs per clutch were 1.7% (± 0.6%) and 7.9% (± 2.1%) respectively.

MORTALITY RISKS. At West Island we observed very low levels (< 5 instances) of hatchling (*N. depressus*) depredation by crabs. We did not observe any predation of turtle eggs, despite the presence of wild dogs (groups of around five to ten have been sighted) and feral cats (one sighted and many tracks observed along the top of the beach) on the northern beach of West Island. In September 2001, we found one female *N. depressus* that had died on her way back to the water following a nesting attempt. This female showed signs of having been attacked by dogs, though we could not establish whether this attack was pre or post-death. However, during the survey in September 2002, the research team found wild dogs lethally attacking a female while she was ashore nesting. No turtles were found trapped in marine debris or had injuries consistent with shark or crocodile attack. During our studies, local Aboriginal families did not take any clutches of eggs or any nesting females for consumption.

DISCUSSION

The Flatback Turtle, referred to locally as Dhadhiwhanjhni, is listed as a threatened species under the Australian legislation, yet little is known about general biology for the northern and western populations Environment Australia (1998). Moreover, in the species review by Environment Australia, (1998), the nesting population in the general Eastern Arnhem Land area (which includes the Sir Edward Pellew Islands) is recorded as being of undetermined size with a likely involvement of 1000s of females annually. Although some work has been carried out over the last decade in and around the SEP group, previous authors have mainly focused on the broad distribution of nesting sea turtles (Chatto, 1997), the anthropological importance of sea turtles to local Aboriginal people (Bradley, 1997a, b; Baker, 1999), or report occasional observations (Cogger, 1968; Cogger & Lindner, 1969; Limpus & Reed, 1985). Our study, using ground surveys on several of the islands in this group, collected both qualitative and quantitative data and thus present a more detailed and extensive estimation of sea turtle nesting activity in this region of the Gulf of Carpentaria.

DISTRIBUTION AND SIZE OF THE NESTING POPULATIONS. Nesting of both *Natator depressus* and *Chelonia mydas* occur on several of the SEP islands (This study; Cogger, 1968; Chatto, 1997; Bradley, 1997a, b). However, we found the majority of sea turtle nesting activity occurred on two islands, West Island and Vanderlin Island. More specifically at West Island's north beach we recorded nesting by both species at a rate of approximately three *N. depressus* to one *C. mydas* per night. In contrast, on the north-east coast of Vanderlin Island we only recorded nesting by *C. mydas*, and information from local traditional owners and residents indicated that they had not seen *N. depressus* nesting on the island. Furthermore, although most *C. mydas* nesting is concentrated on the north-eastern beaches, during large nesting seasons most of the other sandy beaches on Vanderlin Island also receive small numbers of nesting *C. mydas* (Archie Johnson pers. comm., TOI).

Aside from West and Vanderlin Islands, both Skull and Watson Islands receive small numbers (<100 clutches per year) of nesting turtles (primarily *N. depressus*: this study; Bradley, 1997a, b; Chatto, 1997) and presumably small numbers of *C. mydas* during some breeding seasons. Other possible nesting sites that we did not survey for nesting turtles include the two local mainland beaches (combined length of approximately 40km), North Island, Pearce Island or Urquhart Island. While it is likely that the mainland beaches receive very little nesting (TOI and <10 tracks per kilometre – Chatto, 1997) by either *N. depressus* or *C. mydas*, several authors have suggested that the northern beaches of North Island, Pearce Island and Urquhart Island probably receive an unknown level of sea turtle nesting between July and October each year (Paradice, 1924 [cited in Limpus & Reed, 1985] Cogger, 1968; Cogger & Lindner, 1969; Chatto, 1997). In particular, while *C. mydas* probably nest in small numbers at each location, Pearce Island may receive somewhere in the order of 10s of female *N. depressus* per year. Furthermore, based on both information from TOs (this study; Cogger & Lindner, 1969) and track observation data from Chatto (1997), it also appears that West Island, Urquhart Island and North Island receive some nesting by *E. imbricata* or *L. olivacea*. However, despite 35 days of surveys on West Island we found no additional evidence to confirm or deny that either *E. imbricata* or *L. olivacea*, nests in the region.

Based on the results from our study, combined with the scattered mainland nesting recorded

by Chatto (1997) we estimate that the annual nesting populations of both *N. depressus* and *C. mydas* in the local SEP region is in the low 100s of females. However, estimating the size of green turtle nesting populations based on limited data is difficult, because the size of annual green turtle breeding populations fluctuates widely among years (Limpus & Nicholls, 1988; 2000). Given large annual fluctuations and unpublished Queensland Parks and Wildlife Service (QPWS) data indicating that 2001 was a slightly below average nesting year in Queensland (Limpus et al. 2003 for data on the number of females nesting each year), our single season of data for *C. mydas* may underestimate average nesting densities. There is currently no published data available on long-term fluctuations of *N. depressus* nesting populations, and a relationship between the numbers of females nesting each year and El Niño Southern Oscillation has not been described for this species. Thus we cannot rule out a similar error for our estimates of the *N. depressus* nesting population.

DIRECT TAKE OF FEMALES AND EGGS. The harvest of turtle eggs for consumption by local Aboriginal people is reportedly small (TOI) and consists of opportunistic gathering when weather permits access to the nesting beaches. Indeed, local island residents (Archie Johnson, Steve Johnson, Richard Dickson and Thomas Simon) indicated to us that this harvest would rarely exceed more than five *N. depressus* clutches and 10 *C. mydas* clutches per year across all islands. Similarly, the hunting of nesting turtles from beaches in the SEP area is rare. There are at least three other major influences on the green turtle population in the Gulf of Carpentaria. First, a direct, and unquantified take of nesting turtles from nesting beaches exists in other areas, e.g. Groote Eylandt (Hamann & Wohling unpub. data), the Wellesley Island group (Angus McIvor, Wellesley Islands Aboriginal Corporation, pers. comm.) and north-east Arnhem Land (Kennett et al., 1997). Second, there is a direct take of turtles from their foraging areas both by Aboriginal people and overseas commercial harvests (Kennett et al. 1997; Henry & Lyle, 2003). Indeed, genetic (mtDNA) information indicates that approximately 12% of the *C. mydas* taken in the Bali commercial turtle trade are from the Gulf of Carpentaria population (Dethmers & Broderick, 2003). Third, the accidental capture and drowning of sea turtles in discarded fishing nets has recently been revealed as a significant problem, indeed 205 turtles (including 36 *C. mydas*) were found entangled in nets that washed ashore in north-east Arnhem Land between 1996 and 2002 (Kiessling, 2003). A concerted effort addressing genetic analysis of these entangled turtles needs to be taken to reveal more about which nesting populations are at risk from this impact, and provide a baseline for management.

OTHER THREATS TO LOCAL NESTING POPULATIONS. We observed very little depredation of turtle eggs or hatchlings at any of the locations. However, we assume that depredation by birds could occur at some level because bird species previously recorded foraging on flatback hatchlings at other locations in northern Australia were observed on beaches in the SEP e.g. Pied Oyster Catchers (*Haematopus longirostris*), Beach Thick Knees (*Esacus neglectus*), Silver Gulls (*Larus novaehollandiae*), and various raptor species (Limpus, 1973; Duncan Limpus pers. comm.). Other predators known to forage on eggs or hatchlings at Australian rookeries but not observed (or recorded by local inhabitants) on these islands are wild pigs (*Sus scrofa*), rats (*Ratus ratus*), foxes (*Vulpes vulpes*) and Dingoes (*Canis lupus dingo*). While small goannas (species unknown) have been sighted on at least one island (Vanderlin Island) they have not been recorded eating turtle eggs or hatchlings. Despite the presence of crocodiles (*Crocodylus porosus*) in the waters around these islands, we found no visible signs or anecdotal evidence to indicate that crocodiles feed on Sea turtles while they are ashore nesting. Of more concern are the wild dogs (*Canis lupus familiaris*) and feral cats (*Felis catus*) on West Island. While the dogs pose a current threat to nesting turtles, cat predation on sea turtle hatchlings poses a potential problem (see Seabrooke, 1989) and management initiatives should be directed towards monitoring, and if necessary eliminating, these mortality sources.

Although our data was collected during brief periodic visits to the islands, and across a large island group, they provide important additional baseline observations that may be combined with existing knowledge for the management of sea turtle populations in the Gulf of Carpentaria. Local Indigenous ranger groups or Aboriginal Resource Centres are in excellent positions to either manage projects or collaborate with other parties on projects that are geared towards developing an understanding of the biology and management of the natural resources within their environment. Priority areas for future sea turtle

work in the SEP could include: 1) identification of species composition and abundance of nesting females on the mainland beaches, North Island, Pearce Island and Urquhart Island; 2) quantification of hatchling production at the main location for each species; and finally 3) collaboration with GoC fishers to quantify likely mortalities of sea turtles in regional fisheries.

ACKNOWLEDGEMENTS

Funding for this project was obtained through a Coasts and Clean Seas grant to Peter Whitehead and R. Kennett from the Key Centre for Tropical Wildlife Management (KCTWM) and KCTWM/Centre for Indigenous Natural and Cultural Resource Management (CINCRM) respectively of Charles Darwin University. M. Hamann completed the field work associated with this project while employed as a Research Associate by the KCTWM and CINCRM. This project could not have been completed without the dedicated assistance of the following people and organisations, WWF-Darwin, Mabunji Aboriginal Resource Centre, Claudette Albert, Roger Albert, Josh Coates, Terrence Couper, Richard Dickson, Nancy FitzSimmons, Sylvia Francis, Archie Johnson, Steve Johnson, Megan McCann, Brian Simon, Thomas and Barbara Simon, Shirley Simon, Marc Wohling and the families living at Base Bay, Wathunga and West Island. This project was carried out under NTU Animal (A01014) and Human (H01024) ethics permits and a NTPWC permit (10834).

LITERATURE CITED

BAKER, R. 1999. Land is life: from bush to town, the story of the Yanyuwa people. (Allen & Unwin, Australia).

BRADLEY, J. 1997a. Li-anthawirriyarra, people of the sea. Yanyuwa relations with their marine environment. PhD thesis, Northern Territory University, Darwin.

1997b. How can a whitefella know it all? Indigenous science-western science and marine turtles. Pp 25–32. In, Kennett, R., Webb, A., Duff, G., Guinea, M. & Hill, G. (eds), Marine turtle conservation and management in northern Australia. Centre for Indigenous Natural and Cultural Resource Management and Centre for Tropical Wetlands Management. Northern Territory University, Darwin.

CHATTO, R. 1997. A preliminary overview of the locations of marine turtle nesting in the Northern Territory. Pp 33–36. In, Kennett, R., Webb, A., Duff, G., Guinea, M. & Hill, G (eds) Marine turtle conservation and management in northern Australia. Centre for Indigenous Natural and Cultural Resource Management and Centre for Tropical Wetlands Management. Northern Territory University, Darwin.

COGGER, H.G. 1968. Reptiles of the Pellew Islands. Minmag 19: 21–23.

COGGER, H.G. & LINDNER, D.A. 1969. Marine turtles in northern Australia. Australian Journal of Zoology 15: 150–159.

CRUZ, B.J. & FRAZIER, J. 2000. More on error taboos: counting eggs and egg shells. Pp. 44–46. In Abreu-Grobois, F.A., Briseno-Duenas, R., Marquez, R. & Sarti, L (eds) Proceedings of the Eighteenth International Sea Turtle Symposium. US Dept. of Commerce. NOAA Technical Memorandum NMFS-SEFSC-436, 293.

DETHMERS, K. & BRODERICK, D. 2003. Green turtle fisheries in Australasia: Assessing the extent of their impact using mtDNA markers. Pp 41–44. In: Proceedings of the Twenty Second International Sea Turtle Symposium, Miami 2002. US Dept. of Commerce. NOAA Technical Memorandum NMFS-SEFSC-503.

ENVIRONMENT AUSTRALIA, 1998. Draft recovery plan for marine turtles in Australia. Department of Environment Australia, Canberra.

GUINEA, M. 1994a. Sea turtles of the northern territory. Pp 15–21. In, James, R. (ed.), Proceedings of the marine turtle conservation workshop. Sea World Nara Resort, Gold Coast, 14–17 November 1990. Australian Nature Conservation Agency, Canberra.

1994b. Nesting seasonality of the Flatback Sea Turtle *Natator depressus* (Garman) at Fog Bay, Northern Territory. Pp 150–153. In, James, R. (ed.) Proceedings of the marine turtle conservation workshop. Sea World Nara Resort, Gold Coast, 14–17 November 1990. Australian Nature Conservation Agency, Canberra.

HENRY, G.W. & LYLE, J.M. (eds), 2003. The National Recreational and Indigenous Fishing Survey, FRDC project No. 99/158.

KIESSLING, I. 2003. Finding solutions, derelict fishing gear and other marine debris in northern Australia. National Oceans Office, Darwin.

KENNETT, R., MUNUNGURRITJ, N. & YUNUPINGU, D. 1997. The Dhumurru miyapuna project. Pp. 69–76. In, Kennett, R., Webb, A., Duff, G., Guinea, M. & Hill, G. (eds) Marine turtle conservation and management in northern Australia. Centre for Indigenous Natural and Cultural Resource Management and Centre for Tropical Wetlands Management. Northern Territory University, Darwin.

LIMPUS, C.J. 1973. Avian predators of sea turtles in south-east Queensland rookeries. The Sunbird 4: 45–51.

1985. A study of the loggerhead turtle, *Caretta caretta* in eastern Australia. PhD thesis, The University of Queensland: Brisbane.

1992. Estimation of tag loss in marine turtle researeh. Wildlife Researeh 19: 457–469.

LIMPUS, C.J. & REED, P.C. 1985. Green sea turtles stranded by cyclone Kathy on the south-western coast of the Gulf of Carpentaria. Wildlife Research 12: 523–533.

LIMPUS, C.J. & NICHOLLS, N. 1988 The southern oseillation regulates the annual numbers of green turtles (*Chelonia mydas*) breeding around northern Australia. Australian Wildlife Research 15: 157–162.

2000. ENSO Regulation of Indo-Pacifie Green Turtle Populations. Pp 399–408. In, Hammer, G.L. (ed.), The Australian Experience. Kluwer Aeademie Publishers.

MILLER, J.D. 1999. Determining clutch size and hatching success. Pp 124–129. In, Eekert, K., Bjorndal, K.A., Abreu Grobois, F.A. & Donnelly, M. (eds), Research and management teehniques for the conservation of sea turtles. IUCN/SSC Marine turtle specialist group publieation No. 4.

PARADICE, W.E.J. 1924. The Sir Edward Pellew group of Islands: report with speeial referenee to biology and physieal features. Australian Commonwealth Parliamentary Report General Session 1923–24, 143: 1–20.

SCHÄUBLE, C.S. 2002. Establishment of a marine turtle database for Kakadu National Park, 2002. Pp 1–46 Unpub. report to Environment Australia, Kakadu National Park.

SEABROOK, W. 1989. Feral eats (*Felis catus*) as predators of hatehling green turtles (*Chelonia mydas*). Journal of Zoology 219: 83–88.

SCHROEDER, B.A. & MURPHY, S. 1999. Population surveys (ground and aerial) on nesting beaches. Pp 45–55. In, Eekert, K., Bjorndal, K.A., Abreu Grobois, F.A. & Donnelly, M. (eds), Researeh and management techniques for the eonservation of sea turtles. IUCN/SSC Marine turtle speeialist group publication No. 4.

VANDERLAY, R. 1997. Nesting ecology of flatbaek sea turtles of West Alligator Head and Field Island, Kakadu National Park. Ms thesis, Northern Territory University, Darwin.